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ON THE BEHAVIOR OF TYPE-Pi1 MICROPULSATIONS AT MAGNETOCONJUGATE POINTS

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SUMMARY

The Sip-bursts, one of the forms of Pi1-micropulsations, are studied at Sogra and Kerguelen. The Nishida theory on the mechanism of their onset finds its corroboration in the case of the concomitant shift of the aurora zone. However, the authors disagree with the latter, when it ascribes Pi2-pulsations to the same mechanism, except for oscillations with period < 5-10 sec.

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1. The object of the present paper is the description of the results of investigation at magnetoconjugate points Sogra (58° N.lat., 122° E.long.) and Kerguelen (58°S.lat., 124°E.long.) of one of the forms of Pi1-pulsations known as bursts [1 –4].

The Sip-bursts are mainly observed at high-latitude observatories. They are of short duration (from 3 to 10 min.) and have either the character of a solitary event, or a group of pulsation bursts, following one another with an interval of some 10 to 20 min. (Fig.1)

The Sip-bursts are registered in evening, night or early morning hours. The maximum of frequency of their appearance is confined to pre-midnight hours.

Comparison of registrations of micropulsations with those of other forms of geomagnetic field variations attests to the fact that Sip-bursts are attended by irregular type-Pi2-pulsations, developing in their initial part. However, they reflect the characteristic microstructure of Pi2-trains only when the latter are excited at the backround of bay-like perturbations.

(*) O POVEDENII MIKROPUL'SATSIY TIPA Pi1 V MAGNITOSOPRYAZHENNYKH TOCHKAKH
* [presumably "GENDRIN"]; ** [presumably J. LAURENT"]

Thus, 54 Pi2-trains were registered in November 1966, of which 40 were attended by Sip-bursts. In all the cases noted this phenomenon was observed on the leading front of bay-like disturbances.

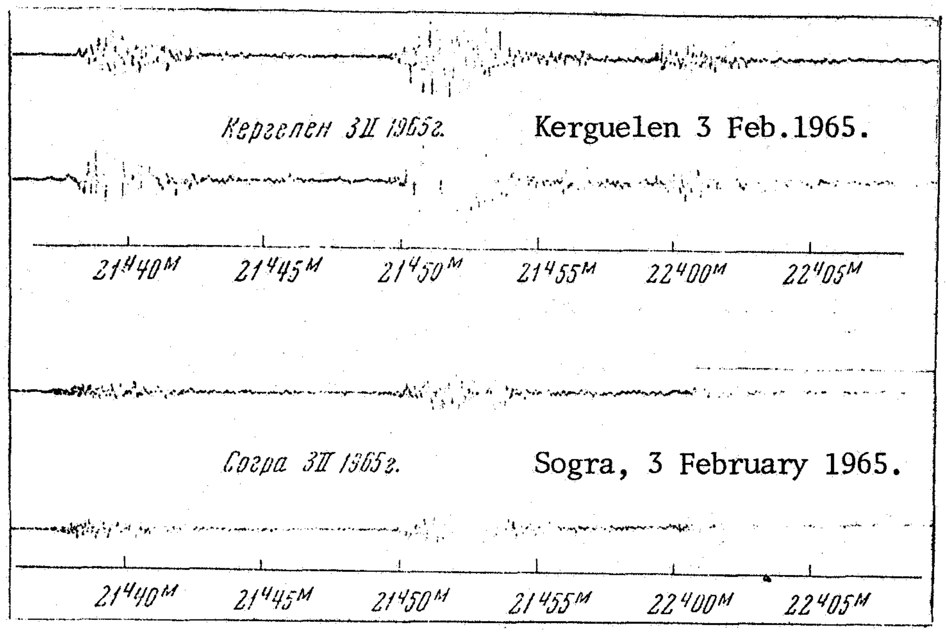

Fig.1

As may be seen from Fig.1, Sip-bursts appear simultaneously at magnetoconjugate points, but their frequency spectrum is somewhat different. Their sonographic analysis was conducted with the view of a more detailed study of burst spectrum and autocorrelation signal functions were computed from recordings in Sogra and Kerguelen on 3 February 1965 (Figs. 2 and 3). It follows from the sonograms that at time of their excitation Sip-bursts have a broad frequency range. A gradual suppression of high-frequency harmonics takes place in the course of burst development. If the event includes a group of bursts, the development of each of them takes place independently. The sonograms offer convincing evidence of the nonidentity of the Pi1-spectrum at magnetoconjugate points.

Comparison of the form of autocorrelation functions corroborates also the difference of Sip-burst spectra at Sogra and Kerguelen. It follows from Fig.2 that the spectral density of signals is not uniform, but has a maximum at specific frequencies which are different at the magnetoconjugate points.

Note that the characteristics of the apparatus utilized at processing did not allow us to analyze signals with frequencies < 0.2 cps. However, it may be seen directly from the magnetograms (Fig.1) that the bursts contain also oscillations with period from 5 to 15 sec. In the considered case of bursts on 3 February 1965 this event was attended by excitation of type-Pi2 pulsations and by a bay-like disturbance.

2. The appearance of the considered micropulsations on the leading front of bay-like disturbances and their high-latitude character indicate that this phenomenon is apparently linked with the injection of particles into the lower

layers of the ionosphere in the aurora zone. The coincidence of excitation time of Sip-bursts with riometric absorption of cosmic radioemission and X-ray emission increase revealed in [5], also corroborates the indicated point of view. According to [5] a sharp displacement of the aurora zone takes place at time of Sip-bursts. Visual observations of aurora glow have shown that

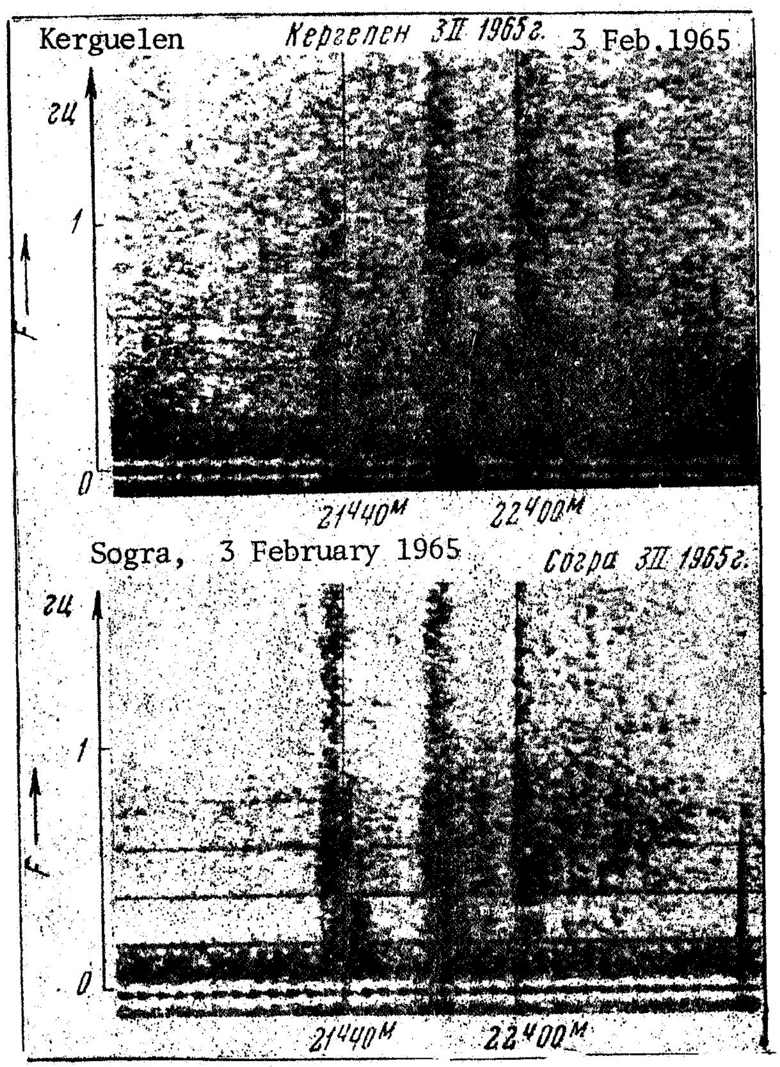

Fig.2

bursts of radial electronic oscillations are observed at that time ($\nu_3(A_1)$ 892 cm^{-1}, $\nu_3(B_1)$912 cm^{-1} and $\nu_3(B_2)$ 925 cm^{-1}. *...* A band with a shape of glow located 100 — 20 km to the south of the main zone of luminescence. This case

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... [This sentence is entirely unintelligible in the original text, something obviously missing. Translation is given as is]

speaks in favor of the Nishida's theory [6], who explains the nature of the phenomenon by gyroresonance interaction occurring between the beam of electrons and the surrounding plasma. Micropulsations with frequency < 1 cps may be generated at altitudes of the order of 1000 to 2000 km and, consequently, the difference in the state of plasma at these heights in the northern and southern hemispheres leads to the difference in in the spectra registered at emissions' conjugate points.

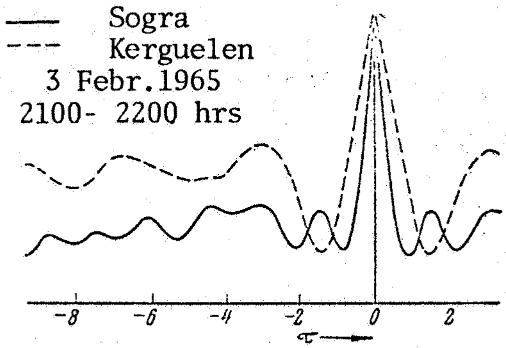

Fig.3

As already noted above, Sip-bursts are accompanied by type-Pi2 pulsations. According to the conclusions drawn in [6], an identical physical mechanism is ascribed to these phenomena. However, one cannot agree with such an opinion. Comparison and analysis of magnetograms with recordings of Pi2- pulsations obtained at Sogra and Kerguelen [see ST–GM–10675], is evidence of good agreement in the behavior of such type pulsations at magnetoconjugate points [7]. Apparently, the physical mechanism proposed in [6], is valid only for oscillations with period < 5 to 10 seconds.

**** THE END ****

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